

NASA Aerospace Database Subject Scope ... An Overview

NASA Aerospace Database Subject Scope ... An Overview

The NASA Scientific and Technical Information (STI) Program manages the vast amount of information pertinent to aerospace research and development and makes this information available to NASA and the aerospace community worldwide. The main tool in carrying out this mission is the NASA Aerospace Database, a publicly available subset of the NASA STI Database. The NASA Aerospace Database contains over 2,000,000 citations to reports, journal articles, and other publications.

This booklet outlines the subject scope of the NASA Aerospace Database. It lists the topics of interest to NASA and places them within the framework of broad aerospace subject categories. For detailed explanations of the subjects themselves, see the *NASA Scientific and Technical Information System ... Its Scope and Coverage*, December 1988 (NASA SP-7065).

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- 02-02 Aerodynamics of Bodies
- 02-03 Airfoil and Wing Aerodynamics

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99 General

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- 82-01 Information Technology

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- 84-01 World Space Programs and Aerospace Law
- 84-02 Space Commercialization

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- 85-01 Urban Technology and Transportation

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- 89-02 Stellar Astronomy and Cosmology
- 89-03 Meteors and Meteorites

90 Astrophysics

- 90-01 Gravitation
- 90-02 Astrophysical Plasmas

91 Lunar and Planetary Exploration

- 91-01 The Moon
- 91-02 Planetary Sciences and Exploration

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

01 Aeronautics (General)

Related Topics

84-01 *World Space Programs and Aerospace Law.*

NASA programs in general; foreign aerospace programs; international cooperation; law related to space and aeronautics; Congressional aerospace hearings.

02 Aerodynamics

02-01 Aerodynamic Characteristics

Lift, drag, stability, control, and balance; dynamic properties.

02-02 Aerodynamics of Bodies

Aerodynamics of cylindrical, conical, rotating, lifting, and symmetrical bodies; aerodynamic configurations.

02-03 Airfoil and Wing Aerodynamics

Aerodynamics of wings and airfoil shapes and forms; supercritical wings.

Related Topics

09-01 *Wind Tunnels*

Wind tunnel and shock tube installations, test programs, and technology.

34-01 *Boundary Layer Technology*

Flow characteristics and mechanics; boundary layer control; combustion control; separation; transition and turbulence; mathematical models; wind tunnel tests.

03 Air Transportation and Safety

03-01 Commercial and General Aviation

Design, operation, and maintenance of commercial and general aviation aircraft; air traffic control and safety factors.

03-02 Helicopters and Ground Effect Machines

Design, performance, and control of helicopters, hovercraft, and ground effect machines; rotor aerodynamics.

03-03 STOL/VTOL Aircraft

Design and stability control of short takeoff and landing aircraft and vertical takeoff and landing aircraft; aircraft configurations.

03-04 Supersonic Transport

Research and concepts in supersonic, transonic, and hypersonic transports; Concorde aircraft; aerospace planes.

03-05 Aircraft Noise and Sonic Boom

Effects and measurement of sound intensity of aircraft and sonic booms; noise prediction and reduction.

03-06 Aircraft Safety and Safety Devices

Aircraft safety studies; accident investigation; air piracy; safety techniques and safety devices.

03-07 Clear Air Turbulence

Atmospheric turbulence, diffusion, and counterflow; wind shear and microbursts.

04 Aircraft Communications and Navigation

Related Topics

17-02 *Navigation Systems*

Spacecraft and aircraft navigation systems including star trackers, inertial systems, doppler and stellar navigation; navigation instruments.

See also *Subject Category 32 Communications and Radar.*

05 Aircraft Design, Testing and Performance

05-01 Hydraulic and Pneumatic Systems

Hydraulic and pneumatic equipment and instrumentation; component reliability; hydraulic test tunnels.

05-02 Auxiliary Electrical Systems

Electrical and solar auxiliary power sources; performance tests and systems analysis; reliability engineering.

06 Aircraft Instrumentation

Related Topics

19-01 *Spacecraft Instrumentation*

Spacecraft instruments, gauges, indicators and instrument systems.

07 Aircraft Propulsion and Power

07-01 Jet Propulsion

Propulsion system performance and configurations of turbojet, pulsejet, and ramjet aircraft engines; combustion physics.

08 Aircraft Stability and Control

Related Topics

02-01 *Aerodynamic Characteristics*

Lift, drag, stability, control, and balance; dynamic properties.

34-01 *Boundary Layer Technology*

Flow characteristics and mechanics; boundary layer control; combustion control; separation; transition and turbulence; mathematical models; wind tunnel tests.

09 Research and Support Facilities (Air)

09-01 Wind Tunnels

Wind tunnel and shock tube installations, test programs, and technology.

Related Topics

03-01 *Commercial and General Aviation*

Design, operation, and maintenance of commercial and general aviation aircraft; air traffic control and safety factors.

See also *Subject Category 02 Aerodynamics*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

12 Astronautics (General)

Related Topics

84-01 *World Space Programs and Aerospace Law*

NASA programs in general; foreign aerospace programs; international cooperation; law related to space and aeronautics; Congressional aerospace hearings.

13 Astrodynamics

13-01 Celestial Mechanics and Orbital Calculations

Orbital calculations for celestial mechanics and spacecraft trajectories; applications of mathematics; space mechanics.

14 Ground Support Systems and Facilities (Space)

14-01 Spacecraft Ground Support

Spacecraft launch facilities and ground operational

support systems; network control; logistics.

Related Topics

17-04 *Tracking*

Tracking installations, personnel, and equipment; systems using radio, radar, infrared, or optical techniques.

33-03 *Antennas*

Types of radar and radio antennas; properties, design, and applications.

14-02 Test Facilities

Rocket test facilities; test ranges and stands; reactor test facilities; engine test facilities.

14-03 Simulators and Simulation

Solar, space, and environment simulators; vacuum chambers; simulation programs, methods, and technology.

14-04 Sterilization

Spacecraft sterilization and contamination control; methods and effects; planetary quarantine.

Related Topics

09-01 *Wind Tunnels*

Wind tunnel and shock tube installations, test programs, technology.

17-04 *Tracking*

Tracking installations, personnel, and equipment; systems using radio, radar, infrared, or optical techniques.

32-02 *Communication Equipment*

Communication equipment including radio, microwave, infrared, light, laser, television, and fiber optic equipment.

15 Launch Vehicles and Space Vehicles

15-01 Launch Vehicles

Large, medium, recoverable, and reusable launch vehicles; spacecraft launching; launch vehicle configurations.

15-02 Sounding Rockets

Meteorological observations from the upper atmosphere by radiosondes; rocket-borne instruments; atmospheric physics.

15-03 Space Probes

Lunar and interplanetary deep space probes; unmanned, maneuverable spacecraft.

15-04 Scientific Satellites

Geophysical, astronomical, and environmental satellites; orbiting observatories; IRAS; SMM; LANDSAT; Explorer satellites.

15-05 Reentry Vehicles

Maneuverable and lifting reentry bodies entering planetary atmospheres; instrumentation; atmospheric entry simulation.

Related Topics

16-01 *Space Transportation and Manned Spacecraft*
All manned space vehicles; space shuttles; Apollo; Skylab; Spacelab; Apollo-Soyuz Test Program; orbiting laboratories and manned flights.

15-06 U.S.S.R. Spacecraft

Manned and unmanned Soviet spacecraft and space programs; Soviet satellites.

Related Topics

14-01 *Spacecraft Ground Support*
Spacecraft launch facilities and ground operational support systems; network control; logistics.

19-01 Spacecraft Instrumentation

Spacecraft instruments, gauges, indicators, and instrument systems.

32-01 Communication Satellites

Domestic and foreign communications satellites.

47-01 Meteorological Satellites

Meteosat; NOAA; Nimbus; Tiros; meteorological data from satellites.

16 Space Transportation

16-01 Space Transportation and Manned Spacecraft

All manned space vehicles; space shuttles; Apollo; Skylab; Spacelab; Apollo-Soyuz Test Program; orbiting laboratories and manned flights.

Related Topics

15-06 U.S.S.R. Spacecraft

Manned and unmanned Soviet spacecraft and space programs; Soviet satellites.

17 Space Communications, Spacecraft Communications, Command and Tracking

17-01 Space Communications

Reentry, lunar, interplanetary, satellite, and spacecraft communications, excluding communication satellites.

17-02 Navigation Systems

Spacecraft and aircraft navigation systems including star trackers, inertial systems, doppler and stellar navigation; navigation instruments.

17-03 Guidance Systems

Inertial, midcourse, and reentry guidance and control of spacecraft; instrumentation; space navigation.

17-04 Tracking

Tracking installations, personnel, and equipment; systems using radio, radar, infrared, or optical techniques.

Related Topics

33-01 Radar Equipment

Types of radar and implementation; equipment specifications; systems engineering.

33-03 Antennas

Types of radar and radio antennas; properties, design, and applications.

See also *Subject Category 32 Communications and Radar*.

18 Spacecraft Design, Testing and Performance

18-01 Spacecraft Attitude Control and Stabilization

Attitude and stability control of spacecraft; performance tests; systems stability.

18-02 Rendezvous and Docking

Rendezvous guidance; trajectories; docking of spacecraft; orbital mechanics.

18-03 Space Stations

Functions of and systems for a space station; analysis; control; maintenance; human factors engineering.

19 Spacecraft Instrumentation

19-01 Spacecraft Instrumentation

Spacecraft and aircraft instruments, gauges, indicators, systems.

19-02 Sensors and Transducers

Sensing instruments used for measuring pressure, temperature, and acoustics in space vehicles and aircraft.

Related Topics

17-02 *Navigation Systems*

Spacecraft and aircraft navigation systems including star trackers, inertial systems, doppler and stellar navigation; navigation instruments.

32-04 *Telemetry*

Data transmission and measuring; biotelemetry; telephotometry; telepsychometry.

54-05 *Bioinstrumentation*

Instrumentation for measuring and recording biological parameters; biomedical data; medical electronics; bioengineering.

See also *Subject Category 32 Communications and Radar*.

20 Spacecraft Propulsion and Power

20-01 Rocket Engines, Nozzles and Thrust Chambers

Design, materials, and performance tests of rocket engines, nozzles, and thrust chambers; thrust measurement.

20-02 Auxiliary Propulsion

Spacecraft propulsion systems excluding main propulsion systems; auxiliary power sources; propulsion system performance.

20-03 Electric Propulsion

Electromagnetic and electrostatic propulsion; laser, plasma, and ion propulsion; nuclear electric propulsion.

Related Topics

07-01 *Jet Propulsion*

Propulsion system performance and configurations of turbojet, pulsejet, and ramjet aircraft engines; combustion physics.

See also *Subject Category 44 Energy Production and Conversion*.

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

23 Chemistry and Materials (General)

23-01 Chemical Analysis

Qualitative, quantitative, and analytical chemistry;

chromatography; chemical composition.

23-02 Chemical Processes and Engineering

Chemical processes and specific chemical reactions such as oxidation, nitration, hydrogenation, polymerization, etc.

23-03 Luminescence

Chemiluminescence; photoluminescence; bioluminescence; phosphorescence; electroluminescence; fluorescence; optical properties.

23-04 Photochemistry

Photosynthesis, photolysis, photodecomposition, and photodissociation; photochemical reactions; radiation chemistry.

Related Topics

51-02 *Biochemistry*

Study of chemical substances in living organisms; physiochemistry; biological and chemical evolution; experimentation.

24 Composite Materials

24-01 Reinforced Materials and Fibers

Materials reinforced by inclusions; fiber reinforcement; whiskers; filament wound vessels; properties and uses.

24-02 Composite Materials

Types of composite materials including laminates, honeycomb cores, cermets, prepregs, and sandwich and matrix materials; properties and uses.

25 Inorganic and Physical Chemistry

25-01 Corrosion

Metal corrosion; stress corrosion; corrosion prevention; tests for corrosion.

25-02 Metal Crystals

Structure, defects, and technology of metal crystals.

25-03 Coatings

Types of coatings; properties and uses; coating techniques.

25-04 Electrochemistry

Electrochemical processes; electrolysis; electrocatalysts; electrolytic processes; reaction kinetics.

26 Metallic Materials

26-01 Aluminum

Aluminum; aluminum alloys; aluminum compounds; powdered aluminum; properties and uses.

26-02 Beryllium

Beryllium; beryllium alloys; beryllium compounds; properties and uses.

26-03 Liquid Metals

Types of liquid metals; properties and uses.

26-04 Steel

Types of steels and steel alloys; properties and uses.

26-05 Titanium

Titanium; titanium alloys; titanium compounds; properties and uses.

26-06 Refractory Metals

Refractory metals; refractory alloys; superalloys; properties and uses.

26-07 Metallurgy

Powder metallurgy; sintering; fractography; metallography.

27 Nonmetallic Materials

27-01 Plastics

Types of plastics; properties and uses.

27-02 Adhesives

Types of adhesives; properties and uses.

27-03 Ceramics

Types of ceramics; properties and uses.

27-04 Elastomers

Types of elastomers; properties and uses.

27-05 Graphite

Graphite; pyrolytic graphite; graphite composites; properties and uses

27-06 Polymers

Types of polymers; polymer chemistry and polymer physics; properties and uses.

28 Propellants and Fuels

28-01 Liquid Propellants

Types of liquid propellants; storability, handling, and manufacture; properties and uses.

28-02 Solid Propellants

Types of solid propellants; properties and uses; manufacture; combustion efficiency and stability; storage and handling; propellant grain studies; oxidizers and igniters used with solid propellants.

29 Materials Processing

Related Topics

37-09 Vacuum Technology

Vacuum systems, techniques, and processes; vacuum testing, measurement, and material fabrication; application to space commercialization.

84-02 Space Commercialization

Policies, incentives and techniques for commercial ventures in space by private industry.

ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; structural mechanics.

31 Engineering (General)

Related Topics

See *Subject Categories 32 through 39.*

32 Communications and Radar

32-01 Communication Satellites

Domestic and foreign communications satellites.

32-02 Communication Equipment

Communication equipment including radio, microwave, infrared, light, laser, television, and fiber optic equipment.

32-03 Communication Systems

Types of communication systems including television, digital, fiber optic, etc., and specific systems; Defense Communication Systems; Deep Space Network; Local Area Networks, etc.

32-04 Telemetry

Data transmission and measuring; biotelemetry; telephotometry; telepsychometry.

32-05 Radio Noise

Noise spectra; intensity, reduction, and measurement of radio noise sources; amplitude distribution analysis.

32-06 Communication Theory

Information theory; coding automata theory; signal processing; decision theory; probability theory.

Related Topics

33-01 Radar Equipment

Types of radar and implementation; equipment specification; systems engineering.

33-03 Antennas

Types of radar and radio antennas; properties, design, and applications.

33 Electronics and Electrical Engineering

33-01 Radar Equipment

Types of radar and implementation; equipment specifications; systems engineering.

33-02 Semiconductors and Transistors

Types of semiconductors and transistors; devices, materials, and applications.

Related Topics

76-01 Solid State Devices

Devices using solid state components, diodes, and rectifiers.

33-03 Antennas

Types of radar and radio antennas; properties, design, and applications.

33-04 Electronic Components

Types of electronic components; design, properties, packaging, and manufacturing; component reliability; equipment tests.

33-05 Circuitry

Circuit theory; production techniques; reliability; protection; applications.

Related Topics

33-10 Microelectronics

Microcircuits; microelectronic devices and components; microminiaturized electronic devices; microinstrumentation.

33-06 Electrical Equipment

Types of electrical equipment; design, properties, and uses; tests and reliability.

33-07 Amplifiers

Types of electronic amplifiers; design, properties, and applications.

Related Topics

34-03 Fluidics

Fluid amplification; fluid logic circuits; fluid devices; fluid mechanics.

33-08 Feedback and Control Theory

Systems, techniques, and designs.

33-09 Electromagnetic Radiation

Electromagnetic wave propagation; radiation effects; properties, detection, and applications.

33-10 Microelectronics

Microcircuits; microelectronic devices and components; microminiaturized electronic devices; microinstrumentation.

33-11 Microwave and Submillimeter Wave Technology

Microwave research; properties; measuring techniques; applications.

33-12 Magnetism

Theory and research; aeromagnetism; electromagnetism; ferromagnetism; hydromagnetism; paramagnetism; thermomagnetism.

Related Topics

05-02 Auxiliary Electrical Systems

Electrical and solar auxiliary power sources; performance tests and systems analysis; reliability engineering.

32-02 Communication Equipment

Communication equipment including radio, microwave, infrared, light, laser, television, and fiber optic equipment.

34 Fluid Mechanics and Heat Transfer

34-01 Boundary Layer Technology

Flow characteristics and mechanics; boundary layer control; combustion control; separation;

transition and turbulence; mathematical models; wind tunnel tests.

34-02 Gas Dynamics

Applied and theoretical gas dynamics; problem solving; hypersonic and rarefied gas dynamics; gas dynamic lasers.

34-03 Fluidics

Fluid amplification; fluid logic circuits; fluid devices; fluid mechanics.

34-04 Fluid Flow

Types of liquid flow excluding gas and air flow; properties; measuring instruments; fluid mechanics.

34-05 Combustion Physics

Combustion phenomena; kinetics; instability; detonation; theory.

34-06 Heat Transfer, Basic

Types of heat transfer, heat dissipation, and heat resistance; measuring devices; thermodynamic properties.

34-07 Reentry Heat Transfer

Heat transfer problems on reentry and their solutions; hyperbolic reentry; hypersonic reentry.

34-08 Thermal Protection

Materials used in thermal insulation; thermal control coatings; temperature control; materials tests.

34-09 Ablation

Ablation studies; ablating materials; application to reentry vehicles; rocket nozzles; ablative nose cones.

34-10 Cryogenics

Low temperature research; cryogenic fluids and equipment; cryochemistry.

Related Topics

28-01 Liquid Propellants

Types of liquid propellants; storability, handling, and manufacture; properties and uses.

02-01 Aerodynamic Characteristics

Lift, drag, stability control, and balance; dynamic properties.

35-08 Gas Flow Measurement

Devices, applications, and systems for measuring gas flows including optical measuring instruments; laser measurement techniques.

35 Instrumentation and Photography

35-01 Photography

Methods of photography; cameras and photographic equipment; applications and uses.

35-02 Infrared Technology

Radiation measuring devices; infrared instruments; applications and methodologies.

35-03 Instrument Standards and Calibration Techniques

Calibration standards for measuring instruments; techniques; test equipment.

35-04 Temperature Measurement

Heat and temperature measuring devices; applications; systems.

35-05 Pressure Measurement

Pressure measuring devices; applications; systems.

35-06 Display Systems

Cathode ray tubes and display devices; display techniques and principles; helmet mounted displays; head-up displays.

35-07 Data Recording

Data recorders and recording systems and techniques; laser-holographic data recording systems.

35-08 Gas Flow Measurement

Devices, applications, and systems for measuring gas flow including optical measuring instruments; laser measurement techniques.

Related Topics

17-02 Navigation Systems

Spacecraft and aircraft navigation systems including star trackers, inertial systems, doppler and stellar navigation; navigation instruments.

32-04 Telemetry

Data transmission and measuring; biotelemetry; telephotometry; telepsychometry.

47-05 Meteorological Instruments

Types of meteorological instruments; uses and specifications; measuring and recording instruments; meteorological parameters.

54-05 Bioinstrumentation

Instrumentation for measuring and recording biological parameters; biomedical data; medical electronics; bioengineering.

See also *Subject Category 19 Spacecraft Instrumentation*.

36 Lasers and Masers

36-01 Lasers and Masers

References to lasers and masers in general; laser theory; types of lasers and masers.

36-02 Laser Applications

Design, types, and uses; materials; optical properties.

37 Mechanical Engineering

37-01 Bearings and Gears

Types of bearings and gears; uses and applications; materials; product development; mechanical properties.

37-02 Lubrication and Lubricants

Lubrication materials; systems; applications; high temperature; solid lubricants; squeeze films.

37-03 Machining

Machining techniques and processes; machine tools; automation and production engineering.

37-04 Friction and Wear

Types, measurement, and effects of friction and wear; frictionless environment; mechanical and surface properties.

37-05 Seals

Sealants; gaskets; packing; leakage; self-sealing materials; sealing techniques including O-ring and labyrinth seals.

37-06 Welding

Types of brazing, bonding, and soldering; techniques and processes; weld properties.

37-07 Metal Forming

Forming techniques and processes; metal working; malleability.

Related Topics

37-03 *Machining*

Machining techniques and processes; machine tools; automation and production engineering.

37-08 Pumps

Types of pumps; design and uses; performance tests; equipment specifications.

37-09 Vacuum Technology

Vacuum systems, techniques, and processes;

vacuum testing, measurement, and material fabrication; application to space commercialization.

37-10 Nondestructive Testing

Types and techniques; materials tests; automatic test equipment.

37-11 Turbomachinery

Types of turbomachinery; design and uses; equipment specifications; performance tests; aerodynamic characteristics.

38 Quality Assurance and Reliability

38-01 Quality Control and Reliability

Product development; qualitative testing; analysis of materials and structures; reliability criteria for components and structures.

39 Structural Mechanics

39-01 Shells

Shell structures; stresses; loads; buckling and vibration.

39-02 Stresses and Loads

Stresses and loads on launch vehicles, spacecraft, and aerospace structures.

39-03 Structure Vibration and Damping

Vibration and damping in aerospace structures, spacecraft, and airframes; panel flutter.

39-04 Impact Phenomena

Studies of impact phenomena in aerospace structures and components; micrometeoroid impact damage.

39-05 Structural Fatigue

Fatigue studies and analysis; techniques for aerospace structures and components.

39-06 Sandwich Construction

Honeycomb, multilayer, and laminated fabrication; techniques and structures.

39-07 Stress Analysis

Stress calculation; analysis of structures.

39-08 Structural Tests and Reliability

Destructive and nondestructive testing and reliability of aerospace structures, spacecraft, airframes, and large space structures.

GEOSCIENCES

Includes geosciences (general); earth resources and remote sensing; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

42 Geosciences (General)

Related Topics

See *Subject Categories 43 through 48*.

43 Earth Resources and Remote Sensing

43-01 Earth Resources

Earth resources studies; the role of satellites in natural resource development, geology, agriculture, and forestry.

43-02 Geodesy and Cartography

Geodetic positions; satellite surveying; geodetic applications; mapping techniques; analyzing methods; mapping systems.

Related Topics

48-01 *Water Resources and Oceanography*

Water conservation and development; hydrology; remote sensing of floods, snow cover, ice; oceanography; other hydrospheric studies.

85-01 *Urban Technology and Transportation*

Application of aerospace technology to the problem of cities; urban development, planning, research, and transportation; rail transportation; rapid transit systems; police services; water and sewage treatment; waste utilization; air, water, and noise pollution; pollution control; land use.

44 Energy Production and Conversion

44-01 Energy Resources

Production, conversion, transmission, conservation of energy; solar energy conversion; wind power; remote survey of energy resources; hydrogen economy.

44-02 Fuel Cells and Chemical Batteries

Types of fuel cells and chemical batteries; properties and uses; energy storage; chemical auxiliary power units; electrochemistry.

44-03 Solar Space Power

Solar power technology; conversion and efficiency; solar dynamic power systems; auxiliary power sources.

44-04 Nuclear Auxiliary Power

Nuclear auxiliary reactors; isotopic space power; specific SNAP systems.

45 Environment Pollution

45-01 Environmental Pollution Control

Control applications of aerospace techniques including remote sensing, to all aspects of air, water, thermal, and environmental pollution; specific pollutants; noise; noise injuries; noise meters; atmospheric composition; water quality.

46 Geophysics

46-01 Upper Earth Atmosphere

Earth atmosphere above the troposphere; ionospheric composition, phenomena, chemical reactions, and satellite measurement.

46-02 Geology and Seismology

Earth geology, petrography, and orography; earthquake detection; measuring and recording instruments; theoretical models.

46-03 Geomagnetism

Geomagnetic anomaly, fields, latitudes, pulsations, and storms; measuring and data transmitting instruments.

Related Topics

15-02 *Sounding Rockets*

Meteorological observations from the upper atmosphere by radiosondes; rocket-borne instruments; atmospheric physics.

47-01 *Meteorological Satellites*

Meteosat; NOAA; Nimbus; Tiros; meteorological data from satellites.

90-01 *Gravitation*

Gravitation theory, effects, and fields; equations and potential; antigravity; gravitational collapse; gravity gradient control of satellites; geophysical gravitational fields.

93-03 *Radiation Belts*

Inner and outer radiation belts; Van Allen Belt; artificial radiation belts; geomagnetically trapped particles; proton belts; trapped radiation.

47 Meteorology and Climatology

47-01 Meteorological Satellites

Meteosat; NOAA; Nimbus; Tiros; meteorological data from satellites.

47-02 Weather Forecasting

Methods and instruments of weather data acquisition and processing; theory and methods of weather prediction.

47-03 Micrometeorology

Smallest scale observation of physical and dynamic occurrences within the surface boundary layer of the atmosphere including turbulence, air pollution, and launch conditions.

47-04 Cloud Research

Types of cloud formation; cloud physics; nephelometry; cloud seeding.

47-05 Meteorological Instruments

Types of meteorological instruments; uses and specifications; measuring and recording instruments; meteorological parameters.

Related Topics

15-02 *Sounding Rockets*

Meteorological observation from the upper atmosphere by radiosondes; rocket-borne instruments; atmospheric physics.

46-01 *Upper Earth Atmosphere*

Earth atmosphere above the troposphere; ionospheric composition, phenomena, chemical reaction, and satellite measurement.

48 Oceanography

48-01 Water Resources and Oceanography

Water conservation and development; hydrology; remote sensing of floods, snow cover, ice, oceanography; other hydrosphere studies.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

51 Life Sciences (General)

51-01 Biology (Generals)

Microbiology; ecology; botany; genetics; cytology.

51-02 Biochemistry

Study of chemical substances in living organisms; physiochemistry; biological and chemical evolution; experimentation.

52 Aerospace Medicine

52-01 Aerospace Medicine

Aerospace medical problems and studies, e.g., toxicity and weightlessness; medical aspects of astronaut performance reaction; neurophysiology.

52-02 Clinical Medicine

General medicine; body systems and functions; diseases; drugs.

52-03 Physiological Factors

Functions related to body composition, physical performance reaction; neurophysiology.

52-04 Biological Radiation Effects

Effects of radiation on human beings, animals, and plants; physiological tests; radiation therapy; health physics.

53 Behavioral Sciences

53-01 Psychological Factors

Psychological aspects of human behavior; psychiatry; psychophysiology; group dynamics; flight crews; tests.

54 Man/System Technology and Life Support

54-01 Life Support Systems

Life survival equipment and support systems used in spacecraft environments and habitats; space flight feeding; sanitation and waste disposal; closed ecological systems.

54-02 Crew Safety and Protective Clothing

Survival techniques for flight crews; escape and rescue operations; safety devices; space suits and protective clothing; emergency life sustaining systems.

54-03 Human Engineering

Design and engineering of devices, equipment, and artificial environments to the requirements of man.

54-04 Man-Machine Systems

Interrelated technologies and systems of man and machine; man-computer interface; automata theory; systems engineering.

54-05 Bioinstrumentation

Instrumentation for measuring and recording biological parameters; biomedical data; medical electronics; bioengineering.

54-06 Robotics

Development and demonstration of automatically controlled devices that can perform humanlike functions including decision making.

Related Topics

63-01 *Cybernetics and Bionics*

Methods of control and communications common to living organisms and machines; those systems that function in the manner of or resembling human systems.

55 Space Biology**55-01 Extraterrestrial Life**

Exobiology and detection; simulation; genesis of life outside Earth.

Related Topics

14-04 *Sterilization*

Spacecraft sterilization and contamination control; methods and effects; planetary quarantine.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 Mathematical and Computer Sciences (General)**59-01 Applied Mathematics**

Mathematical applications in physical, biological, and aerospace sciences.

59-02 Data Processing

Automatic processing of data; data handling, conversion, correlation, transfer, and compression; retrieval and storage; batch processing; processing terminals and equipment; data management.

60 Computer Operations and Hardware**60-01 Digital and Analog Computers**

Computer hardware; structure; peripheral equipment; applications; hybrid computers.

60-02 Airborne or Spaceborne Computers

Computer design for onboard spacecraft or aircraft flight control; automatic flight and landing control.

61 Computer Programming and Software**61-01 Computer Software**

Computer and language programming; computer systems programs; software tools; software engineering.

61-02 CAD/CAM

Application of technical advances in computers to engineering design, analysis, and production in the aerospace industry.

62 Computer Systems

Related Topics

61-01 *Computer Software*

Computer and language programming; computer systems programs; software tools; software engineering.

81-01 *Aerospace Management*

Management techniques; cost control; production engineering; personnel management.

63 Cybernetics**63-01 Cybernetics and Bionics**

Methods of control and communications common to living organisms and machines; those systems that function in the manner of or resembling human systems.

63-02 Artificial Intelligence

Development of algorithms sensors, actuators, software, and systems for expanding automation to task planning, decision making, generation of computer codes, multiple system coordination, monitoring and diagnosing systems and subsystems.

Related Topics

54-06 *Robotics*

Development and demonstration of automatically-controlled devices that can perform humanlike functions including decision making.

64 Numerical Analysis

64-01 Numerical Analysis

Approximation techniques; mathematical analysis and theory; applications of mathematics; mathematical models.

65 Statistics and Probability

65-01 Probability and Statistics

Statistical techniques and applications; probability and reliability theory; probability equations; problem solving.

66 Systems Analysis

Related Topics

61-01 *Computer Software*

Computer and language programming; computer systems programs; software tools; software engineering.

67 Theoretical Mathematics

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

70 Physics (General)

Related Topics

See *Subject Categories 71 through 77*.

71 Acoustics

71-01 Acoustics

Acoustic attenuation; simulation; scattering radiation and vibration; hydroacoustics.

71-02 Ultrasonics

Science of ultrasonic sound waves; nondestructive testing; clinical medicine; acoustic properties; materials research.

72 Atomic and Molecular Physics

72-01 Atomic Physics

Atomic theory, collision, beams, energy, reactions, and properties.

72-02 Molecular Physics

Molecular theory, energy, structure, collision, and beams; molecules; properties and instrumentation.

73 Nuclear and High-Energy Physics

73-01 Nuclear Physics

Nuclear particles, structure, reactions, and force.

73-02 Radioactivity

Radiation measurement, hazards, and effects; high energy interactions; nuclear medicine; radio-chemistry.

Related Topics

93-01 *Cosmic Radiation*

Primary and secondary cosmic radiation; galactic and stellar radiation.

74 Optics

74-01 Optics

Optical equipment and technology; electron optics; crystal optics; fiber optics; optical properties.

74-02 Light

Light scattering; measurement effects and transmission.

75 Plasma Physics

75-01 Plasma Applications

Plasma arc welding; plasma spraying; plasma power sources; plasma jet technology.

75-02 Plasma Dynamics

Plasma-particle and electromagnetic interactions; space plasmas; laser applications; transport properties.

75-03 Magnetohydrodynamics

Magnetohydrodynamic theory and applications.

Related Topics

90-02 *Astrophysical Plasmas*

Space plasmas; solar, cosmic, stellar, and interstellar plasmas; solar and stellar atmospheres.

76 Solid-State Physics

76-01 Solid State Devices

Devices using solid state components, diodes, and rectifiers.

76-02 Superconductivity

Superconductivity; superconducting magnets; superconducting transition temperatures; critical temperatures; critical field curves of superconducting material.

76-03 Dielectrics

Dielectric material including dielectric constant of materials; electric losses and ohmic resistance of compounds; permeability and polarization of dielectric substances and media.

76-04 Epitaxial Deposition

Film deposition techniques and applications; semiconductor devices; substrates; electrical properties.

Related Topics

33-02 *Semiconductors and Transistors*

Types of semiconductors and transistors; devices, materials, and applications.

33-12 *Magnetism*

Theory and research; aeromagnetism; electromagnetism; ferromagnetism; hydromagnetism; paramagnetism; thermomagnetism.

77 Thermodynamics and Statistical Physics

Related Topics

25-02 *Metal Crystals*

Structure, defects, and technology of metal crystals.

65-01 *Probability and Statistics*

Statistical techniques and applications; probability and reliability theory; probability equations; problem solving.

72-02 *Molecular Physics*

Molecular theory, energy, structure, collision, and beams; molecules; properties and instrumentation.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science and space policy; and urban technology and transportation.

80 Social Sciences (General)

Related Topics

See *Subject Categories 81 through 85.*

81 Administration and Management

81-01 Aerospace Management

Management techniques; cost control; production engineering; personnel management.

82 Documentation and Information Science

82-01 Information Technology

Documentation; information processing and retrieval; information systems; integrated library systems; technology utilization; information management.

83 Economics and Cost Analysis

Related Topics

81-01 *Aerospace Management*

Management techniques; cost control; production engineering; personnel management.

84 Law, Political Science and Space Policy

84-01 World Space Programs and Aerospace Law

NASA programs in general; foreign aerospace programs; international cooperation; law related to space and aeronautics; Congressional aerospace hearings.

Related Topics

15-06 *U.S.S.R. Spacecraft*

Manned and unmanned Soviet spacecraft and space programs; Soviet satellites.

84-02 Space Commercialization

Policies, incentives, and techniques for commercial ventures in space by private industry.

85 Urban Technology and Transportation

85-01 Urban Technology and Transportation

Application of aerospace technology to the problems of cities; urban development, planning, research, and transportation; rail transportation; rapid transit systems; police services; water and sewage treatment; waste utilization; air, water and noise pollution; pollution control; land use.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.

88 Space Sciences (General)

Related Topics

See *Subject Categories 89 through 93*.

89 Astronomy

89-01 Solar Astronomy

Solar activity; solar physics; solar telescopes and observatories.

89-02 Stellar Astronomy and Cosmology

Stellar and galactic astronomy including radio astronomy; origin and evolution of the universe.

89-03 Meteors and Meteorites

Meteor properties and hazards; micrometeoroids and micrometeorites; comets; interplanetary dust.

90 Astrophysics

90-01 Gravitation

Gravitational theory, effect, and fields; equations and potential; antigravity; gravitational collapse; gravity gradient control of satellites; geophysical gravitational fields.

90-02 Astrophysical Plasmas

Space plasmas; solar, cosmic, stellar, and interstellar plasmas; solar and stellar atmospheres.

91 Lunar and Planetary Exploration

91-01 The Moon

Lunar atmosphere; topography; environment; lunar exploration; lunar spacecraft and roving vehicles; surface properties.

91-02 Planetary Sciences and Exploration

Planetary composition, surfaces, atmospheres, and environment; spacecraft and vehicles used in planetary exploration.

Related Topics

15-03 Space Probes

Lunar and interplanetary deep space probes; unmanned, maneuverable spacecraft.

90-02 Astrophysical Plasmas

Space plasmas; solar, cosmic, stellar, and interstellar plasmas; solar and stellar atmospheres.

92 Solar Physics

Related Topics

89-01 Solar Astronomy

Solar activity; solar physics; solar telescopes and observatories.

93 Space Radiation

93-01 Cosmic Radiation

Primary and secondary cosmic radiation; galactic and stellar radiation.

93-02 Solar Radiation and Activity

Solar radiation; observation and instrumentation; hazards to space flight; protection from solar radiation; solar storms; solar flares; solar winds; sunspots.

93-03 Radiation Belts

Inner and outer radiation belts; Van Allen Belt; artificial radiation belts; geomagnetically trapped particles; proton belts; trapped radiation.

99 General

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
1. AGENCY USE ONLY (leave blank)		2. REPORT DATE September 1993		3. REPORT TYPE AND DATES COVERED Special Publication
4. TITLE AND SUBTITLE NASA Aerospace Database Subject Scope - An Overview			5. FUNDING NUMBERS	
6. AUTHOR(S)				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) NASA Scientific and Technical Information Program Code JTT			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) National Aeronautics and Space Administration Washington, DC 20546			10. SPONSORING/MONITORING AGENCY REPORT NUMBER NASA-SP-7107	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Unclassified - Unlimited Subject Category - 82			12b. DISTRIBUTION CODE	
13. ABSTRACT (maximum 200 words) <p>Outlined here is the subject scope of the NASA Aerospace Database, a publicly available subset of the NASA Scientific and Technical (STI) Database. Topics of interest to NASA are outlined and placed within the framework of the following broad aerospace subject categories: aeronautics, astronautics, chemistry and materials, engineering, geosciences, life sciences, mathematical and computer sciences, physics, social sciences, space sciences, and general. A brief discussion of the subject scope is given for each broad area, followed by a similar explanation of each of the narrower subject fields that follow. The subject category code is listed for each entry.</p>				
14. SUBJECT TERMS databases, NASA programs, aerospace science, information systems			15. NUMBER OF PAGES 28	
			16. PRICE CODE A03	
17. SECURITY CLASSIFICATION OF REPORT Unclass	18. SECURITY CLASSIFICATION OF THIS PAGE Unclass	19. SECURITY CLASSIFICATION OF ABSTRACT Unclass	20. LIMITATION OF ABSTRACT Unlimited	

Available from NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934
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